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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,381	04/01/2004	Yongli Huang	33683/AJT	2603

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EXAMINER

JAWORSKI, FRANCIS J

ART UNIT	PAPER NUMBER
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3737

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/817,381

Applicant(s)

HUANG ET AL

Examiner

Jaworski Francis J.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1-18-05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

The disclosure is objected to because of the following informalities: page 1 line 2 delete " of ", line 8 "imaging non-destructive" to -- imaging, non-destructive --, page 4 line 11 "is" to -- are --.

Appropriate correction is required.

The specification page 1 lines 24 – 26 teaches that when the prior art cMUT was fabricated, its support conductive means was either of two forms: a discrete conductive layer applied on a substrate or a substrate was used which had conductive regions. In the prior art example provided as Fig. 1 for the cMUT cell as well as in the fabrication example provided per figs. 2, 3A-G, where an 'n type silicon wafer doped with antimony to achieve low resistance' it appears that it is the latter type of conductive support namely a substrate with conductive regions that is being used to electrically complete the capacitance structure. The Examiner is reading all base claims as generic to both of the types of art-defined 'electrode'.

[Haller et al (US5619476) is cited for its silicon wafer 11 having a discrete gold electrode 14 on the lower surface to complete the capacitance structure in apparent accordance with the discrete electrode type of support conductor means. Another apparent relevant teaching is Schindel et al (US5287331) col. 4 lines 54 – 62.]

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 – 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

For example with respect to claim 1, the specification on pages 1 – 2 bridging makes clear that insulating walls 13 together with support electrode 11 and membrane 12 serve to define a (cMUT) cell 16 which is in one sense the overall cavity of the transducer, and the later specification on pages 3 – 4 bridging makes clear that the etched support posts 22 serve to create wells which are smaller 'sub-cavities' of the cell having only posts 22 as boundaries or, if peripherally located having both of the posts and peripheral wall portions 22 as boundaries. (It appears that 22 on the peripheries are in fact not posts but a peripheral containment ring.)

When read against this context the various language - 'at least one cavity', 'the walls the cavity', 'said cavity' - is vague in relation to the wells-cell and posts-wall surroundment structure relationships as described.

With respect to claims 3, 4 it is unclear how an 'area' i.e. pure space or locale is carried by a support or membrane. Additionally " the support " lacks antecedence in dependency from claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 – 2, 4, 7-9, 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haller et al (US5619476) in view of Schindel et al(US5287331), alone or further in view of Stamm (US4192977).

The former teaches fabrication and structure for a cMUT array as per Figs.1C-1D including a support electrode 11, 14, incomplete support walls and isolation supports of thermal oxide 12, and a silicon nitride membrane 14. Haller et al while not specifically defining cell or well cavity structures or 'posts' states that the cMUT array is providing improvement of spaced membrane elements for broadband operation over support plate surface roughening heretofore practiced in association with ultrasound electrostatic transducers, see col. 1 lines 44 – 64. It would have been obvious in view of Schindel et al to optimize frequency response by providing regular air pockets 4 effectively supported by posts i.e. remaining material either formed from below (non-insulating) or from above via etching of the dielectric insulation immediately below the membrane electrode (see col. 3 lines 32 – 65 and col. 4 lines 9 – 11) since this was

known to enhance broadband operation to higher ultrasound ranges over the prior backingplate roughening technique mentioned in both references.

In the alternative, while the former do not specifically address charge distributions, it would have been obvious in view of Stamm cols. 3-4 bridging to use projection spacer distribution in an ultrasound directional device since this assists in providing directionality to the main beam lobe, see Fig. 5.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haller et al in view of Schindel et al, alone or further in view of Stamm as applied to claims 1 or 2 above, and further in view of Djuric (US4070741). Whereas the former do not specifically teach provision of an (electrical) isolation post carried by the support, it would have been obvious in view of Djuric col. 1 lines 13-30, line 55-col. 2 line 3 and col. 2 lines 40-44 to provide same since the latter acknowledges this to improve device performance since the backing plate may be made smooth for adherence, whereas the former (Schindel et al) makes clear that the modern ultrasound electrostatic array constructs are evolved from the former, see col. 3 lines 6 – 16.

Claims 3, 5-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haller et al in view of Schindel, alone or further in view of Stamm as applied to claims 1 or 2 above, and further in view of Muggli et al (US4081626). Whereas the former are silent as to post and area selection so as to minimize trapped ions, it would have been obvious in view of Muggli (directed to an ultrasound directive rangefinder) col. 1 line 45 – col. 2 line 4 to choose isolation posts 34, 64 and interstitial areas associated therewith in order to avoid irregularly concentrated electric fields such as would be associated

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with trapped ions. Additionally and with respect to claim 3, Muggli et al in col. 7 lines 19 – 23 effectively teaches the providing of an insulating (coated) backing plate protrusion alternative to insulation of the membrane portion from above in order to preserve electrical isolation during deflection contacting of protrusions and membrane or backing plate. The size, shape (34, 64 and aggregate distribution shape) and height (peripheral height decrease, see Fig. 4) in Muggli et al are all chosen to impact frequency response.

The following additional art is cited as of interest:

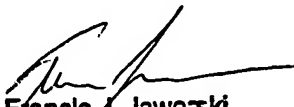
Sawyer (US4418246) ribbing alternatives to backing plate corrugating; Barth (US4665610) col. 3 lines 46 – 58 post formation in cMUT array; Murphy (US Re.28,420) col. 6 lines 65 – 68 post formation ; Lissel et al (US5946273) Fig. 2 element 1a periodic air cell spacing extends frequency response; Kang et al (US6388299) pressure transducer; downward membrane mounted post 32/76 serves to provide uniform field during non-contacting diaphragm deflection , see Fig. 1 vs Fig. 2.

Caliano et al (US2005/0018536) of ineffective date is cited as of interest as directed to formation of pillars in cMUT arrays.

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 703-308-3061.

FJJ:fjj

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Francis J. Jaworski
Primary Examiner